Lessons from Titanic Disaster

Naval Constructor David Watson Taylor, U. S. N., is regarded as one of the foremost authorities on ship construction in the world. He has the unusual distinction of having been graduated by two of the greatest naval schools—the U. S. Naval Academy and the Royal College at Greenwich, England—after having made the highest marks in his examinations that had ever been attained by a student in the history of either institution. In Popular Mechanics, he writes as follows, concerning the loss of the "Titanic":

The "Titanic" catastrophe teaches no new lesson as regards the fallibility of man. It simply furnishes another example of the well established principle that if, in the conduct of any enterprise, an error of human judgment or faulty working of the human senses involves disaster, sooner or later the disaster comes.

Looking backward it seems an error of judgment of the captain of the "Titanic" to risk passage near the ice. That gallant officer and gentleman went down with his ship to honorable death, and his story can never be told. It seems practically certain that he did not for one moment think he was running any material risk of accident to his vessel, much less risk of destruction. The mere fact that he was not on the bridge at the time of the collision is very strong evidence that he thought his course would have cleared the bergs whose position had been reported to him.

Picked captains of Atlantic liners cling to the bridge to the point of exhaustion whenever they consider the circumstances to involve the least danger to the ship.

If Captain Smith erred, it was the error of a captain whose record and experience were of the best. We need not expect to secure greater safety by better captains, and without speculating as regards matters involving personnel and discipline, let us now consider matters of material.

The most salient fact is that if the "Titanic" had carried more boats or a number of life rafts in addition to her boats, many more lives would have been saved. There were 16 large boats, to be swung out by the davits before lowering, and two sea boats swung out at the forward davits ready for instant lowering in the case of man overboard or other emergency. It appears also that two more bats were carried over the officers' quarters, one at least of which was not lowered at all, but floated away when the "Titanic" sank.

There was evidently room for many more boats. The deck plan shows room between the two groups of boats where 10 more could have been carried. Moreover, we learn from the description of the ship published in various technical papers nearly a year ago, that each pair of the davits installed was fitted to handle two boats. So that as regards space there was obviously room to install some 52, instead of 16 large boats, making in all 56, instead of 20, and there is no difficulty from topheaviness in the way of carrying the larger number.

The boat equipment on board appears to have complied with the minimum requirements of the English Board of Trade, the responsible governmental authority in this connection. It seems practically certain that regulations all over the world will be promptly changed, and the boat equipment of these very large ships should certainly be increased to provide boat accommodations for every soul allowed on board. There is a great opportunity here for international team work and it is very desirable that not only requirements for safety of passengers, but tonnage rules, berthing requirements of steerage passengers, etc., should be internationally standardized.

The facts that under the circumstances more boats would have saved many more lives from the "Titanic," and that she could have carried about three times as many boats as she had should not blind our eyes to the fact that lifeboats are, after all, a very inefficient device for saving life from a sinking vessel. If the "Titanic" had actually carried 56 boats, it does not seem at all likely that nearly all of them would have been launched. One of the 20 she did carry was not launched at all, being inconveniently stowed. The crew was new to the ship and apparently had been given no adequate boat drill, but on the other hand the conditions were exceptionally favorable, there being apparently an unusually smooth sea and little list of the vessel at any time. Had there been any sea worthy of the name, the roll of survivors would have been short indeed.

The difficulty of launching lifeboats is enormously increased by a very moderate sea and the chance of living in them after launching very much reduced. Properly built boats with air tanks would not sink, but if overloaded and inadequately manned, the majority of the passengers would succumb very soon. A boat which would carry 50 or 60 persons in smooth water could not carry nearly so many in rough water.

The area in plan of the large lifeboats of the "Titanic" was somewhere near 200 square feet. Imagine some 60 persons crowded upon a rectangular platform of this area, say 12 by 18 feet, and some idea can be formed of the conditions existing in a "Titanic" lifeboat loaded to capicity.

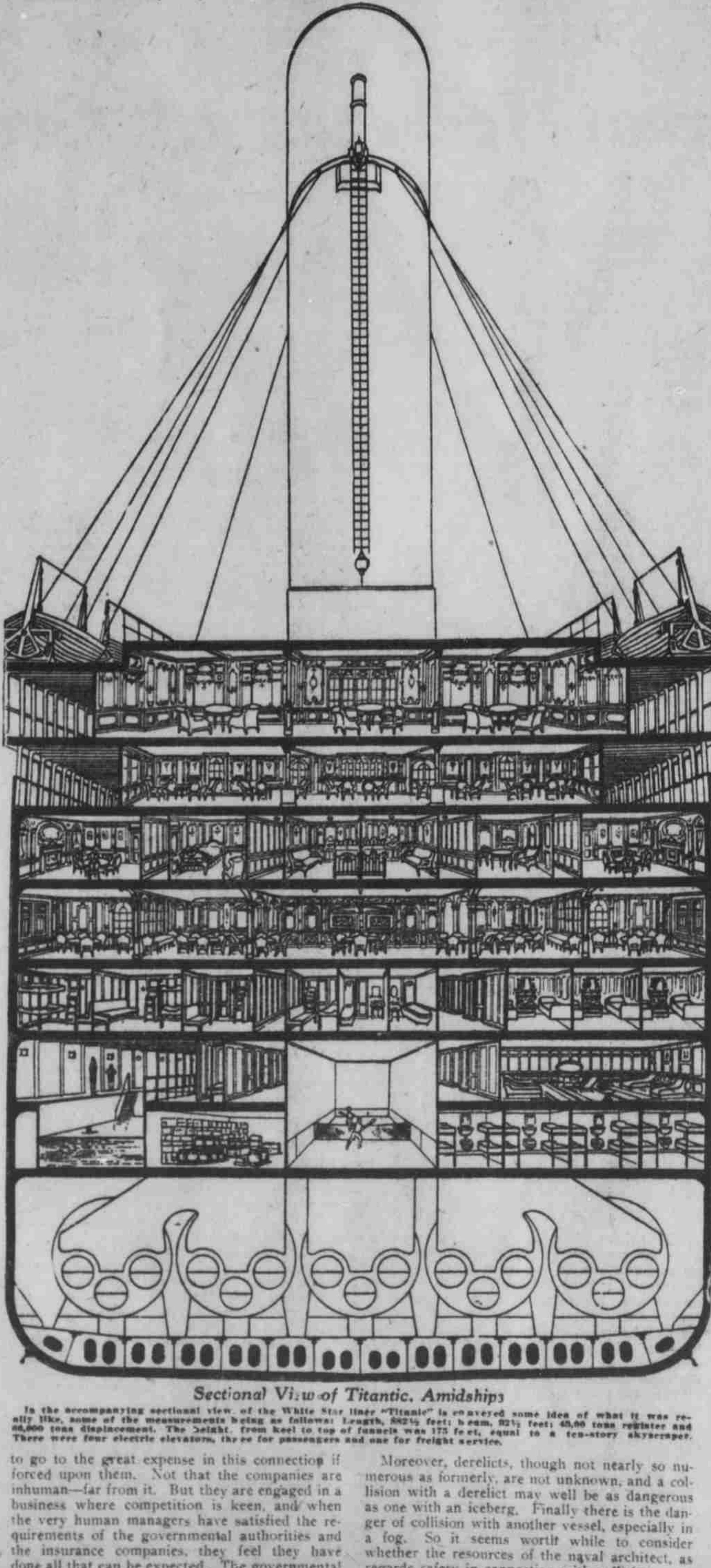
Lifeboats, no matter how much improved, will
the ·bly always be inefficient as live-saving ap-
and th for the mammoth steamers of today.
Smith's h different is needed. Twenty years
er, in spit portant that a life-saving appliance
agent in Shern keep afloat, but be able to make
crest of the hill, a It was not sufficient to rely
"Howdy Bumpass ing picked up. Thanks to
of the South; "been t all changed now. Even
"Yep. I'm dragging ner were sunk without
to the camb on Powder r ireless, the survivors
h for them.

After the loss of the "Bourgoyne" from a collision, in 1898, there was a prize offered by the heirs of one of those lost for the best device for life saving, resulting in many suggestions, though nothing that appealed to steamship owners as commercially practicable.

There will be a flood of suggestions as a result of the "Titanic" disaster. A favorite idea is a refuge deck or similar device to which all hands repair when the ship begins to sink and which floats cheerfully away as the ship takes her last plunge. The idea is not so easy to carry out as to conceive, but there seem no insuperable mechanical difficulties in the way. The bugagoo that there is an irresistible suction when a ship goes down has been pretty well disposed of for the present by the stories of the "Titanic" survivors. Steamship companies would be loath to go to the great expense in this connection if forced upon them. Not that the companies are inhuman—far from it. But they are engaged in a business where competition is keen, and when the very human managers have satisfied the requirements of the governmental authorities and the insurance companies, they feel they have done all that can be expected. The governmental authorities are supposed to look out for the lives of passengers, and the insurance companies, who stand to lose if a ship is lost, are supposed to insist upon requirements that will reduce to a minimum the chance of such loss.

As illustrating the conservatism of managers of Atlantic lines it may be recalled that vessels carrying cattle from America to England were fitted with bilge keels to reduce rolling long before the practice became common upon passenger vessels. Money is lost when cattle are damaged by heavy rolling, but when passengers lose their appetites from the same cause the expense of the line is lessened.

When the rumors of the "Titanic's" sinking were yet unconfirmed the officials of the company came out boldly with the statement she was unsinkable. Since then there have been claims substantially to the effect that no pains or expense were spared to make her safe, that the naval architect can produce no safer vessel, and the only safety lies in avoiding possibility of collision with icebergs. It is perfectly true that steamer lanes from the United States should avoid the vicinity of icebergs, but there are important ports which cannot be reached without some risk of encountering bergs.



Sectional View of Titanic, Amidships

In the accompanying sectional view of the White Star liner "Titanic" is conveyed some idea of what it was really like, some of the measurements being as follows: Length, 882½ feet; beam, 92½ feet; 45,00 tons register and 66,000 tons displacement. The height, from keel to top of funnels was 175 feet, equal to a ten-story skyscraper. There were four electric elevators, three for passengers and one for freight service.

Moreover, derelicts, though not nearly so numerous as formerly, are not unknown, and a collision with a derelict may well be as dangerous as one with an iceberg. Finally there is the danger of collision with another vessel, especially in a fog. So it seems worth while to consider whether the resources of the naval architect, as regards safety in connection with collision, were really exhausted in the "Titanic."

The broadside elevation of the vessel shows that she had an enormous reserve buoyancey or volume above the water line. Incidentally it will be noticed that the "upper deck" is not the highest deck and the fourth smokestack is not a smokestack at all, but apparently a ventilator from the engine rooms.

The watertight bulkheads are all transverse and all join the outer skin. It is an elementary principle of safety with such an arrangement that bulkheads must be so close together that two adjacent compartments may be flooded at the same time without danger to the vessel. This is a minimum requirement and its obvious reason is that a colliding vessel may strike just at a bulkhead and throw open two compartments at once to the sea.

The "Titanic" had, on her sides above the double bottom, a single skin only. Experience with large steel vessels colliding with the bottom has demonstrated conclusively the graat protective value of the double bottom fitted on such vessels. There is no doubt that if the inner bottom skin had been carried up on the sides of the "Titanic," the protection against collision with icebergs would have been much improved. The best practicable protection along this line would probably have been obtained by carrying the coal in fore and aft bunkers against the side of the ship, with watertight longitudinal wing bulkheads separating the bunkers from the boiler rooms.

Longitudinal bulkheads have been adopted on the fastest vessels crossing the Atlantic today. The additional protection afforded against collisions penetrating the outer skin is obvious. The same idea is readily applied forward of the boiler space where protection is most needed. Longitudinal wing bulkheads have some objections of their own as ships having them will list when damaged, but with vessels having great freeboard the list need not be dangerous. A bulkhead does not confine the water after a collision because it is marked "W. T." (watertight) on the plans. To fulfill its purpose it must be built so that it holds up against the pressure of the water without serious leakage and it must have no holes in it. If it has doors they must be closed. At the bottom of the "Titanic" there were doors in practically every bulkhead.

They were ordinarily worked by hand, but in an emergency a magnet energized by pressing button on the bridge released a friction clu and allowed the door to drop, thus closing by own weight. The drop or "guillotine" type of door is favored today by very few naval architects as against those operated positively by hydraulic or electric power.

While exact information as to the damage done is not available, we may speculate without much danger of exaggerating it. A ship's officer saw water very soon after the collision in the compartment next forward of the forward boiler compartment and firemen were driven from their quarters—two compartments forward of this—by encroaching water. This water may have found its way from the vicinity of the boiler-room bulkhead through the firemen's tunnel.

Assuming that the ship was originally at the water line and that all buoyancy forward of the forward boiler compartment was lost, the new line of flotation which the ship would assume would be different. It will be observed that this is above the top of the bulkhead at the forward end of the boiler room which extends to the so-called "upper deck" only. Hence the water would find its way aft on the upper deck and flood other compartments from above, the sinking of the ship from this position being inevitable. There seems little doubt from statements of the survivors that all compartments forward of the forward boiler-room bulkhead were pierced below water.

If we assume loss of all buoyancy in the forward boiler-room compartment as well as in the compartments forward, the water would be nearly 20 feet over the top of the bulkhead next abaft the damaged portion.

In estimating these water lines it was assumed that the water between bulkheads found its way freely up through decks. It does not appear from the description of the "Titanic" that special endeavor was made to secure horizontal watertight subdivision, and from statements of the survivors, it appears that water found its way up freely through the usual deck openings.

If the vessel had been completely flooded below, forward of the boiler rooms, but with a watertight deck at the water line so that no water could pass up, the new line of flotation would have been vastly different. Even with the forward boiler compartment flooded in addition, the new line with a watertight deck would have have been lower than before being flooded.

This shows how beneficial horizontal watertight division forward would have been. With a tight deck at the water line forward and tight bulkheads of adequate strength running, some to the shelter deck and some to the saloon deck, the "Titanic" could have had every compartment below water from the bow, to and including the forward boiler room, thrown open to the sea, yet would have been perfectly safe.

In conclusion it would seem that the lessons impressed upon us by the "Titanic" disaster in seeking greater safety upon larger passenger vessels are:

As an immediate measure sufficient boats should be carried for all souls on board, but a combination of boats and large unsinkable self-launching life rafts would be better.

2. The radio-telegraphic equipment and operation should be such that vessels near each other should always be able to communicate.

3. Longitudinal watertight wing bulkheads, or the equivalent, should be fitted.

4. Transverse watertight bulkheads should extend to the highest continuous deck as regards several at each end, and several that come next should extend to the next deck below.

5. A stout and reliably watertight deck should be fitted in the vicinity of the water line or a little above it.

6. Rudders should have about double the areas now commonly fitted on merchant vessels, with operating gear of adequate power and speed.